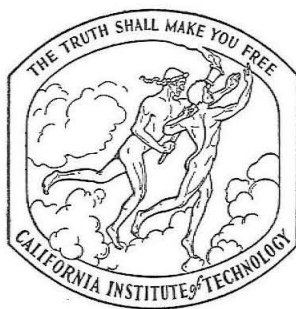


California Institute of Technology



COMMENCEMENT
EXERCISES

Friday afternoon
June eleventh, nineteen forty-eight
at four o'clock

PROGRAM

Presiding:

James Rathwell Page, LL.D., *Chairman of the Board of Trustees*

ORGAN PRELUDE:

CONCERTO IN A MINOR *Bach*

HYMN OF GRATITUDE *Arcadelt*

ROMANCE SANS PAROLES *Bonnet*

James H. Shearer, A. R. C. M., A. R. C. A., *Organist*

PROCESSIONAL MARCH . . . ALLEGRO POMPOSA . *Guilmant*

INVOCATION . . . The Reverend Harold C. Case, D.D., LL.D.

Pastor, First Methodist Church, Pasadena

COMMENCEMENT ADDRESS:

“THE FREEDOM OF SCIENCE”

Vannevar Bush, Sc.D., Eng. D., LL.D.

President, Carnegie Institution of Washington

CONFERRING OF DEGREES:

Candidates for the degree of Bachelor of Science presented by Paul Conant Eaton, A.M., Associate Dean for Upperclassmen.

Candidates for the degree of Master of Science in Science presented by William R. Smythe, Ph.D., Chairman of the Committee on the Course in Science.

Candidates for the degree of Master of Science in Engineering presented by William W. Michael, B.S., Chairman of the Committee on the Course in Engineering.

Candidates for the engineer's degree presented by William N. Lacey, Ph.D., Dean of Graduate Studies.

Candidates for the degree of Doctor of Philosophy presented by Dean Lacey.

CHARGE TO THE GRADUATING CLASS

THE FREDERIC W. HINRICHS, JR.,
MEMORIAL AWARD

ANNOUNCEMENTS

Lee A. DuBridge, Ph.D., Sc.D.
President, California Institute of Technology

BENEDICTION

(The audience is requested to remain seated after the Benediction until the end of the Recessional March)

RECESSIONAL MARCH . . . TOCCATA *Dubois*

Candidates for Degrees

BACHELOR OF SCIENCE IN SCIENCE

JOHN WING ALLINGHAM
DAVID COLLINS BANKS*
GRIFFITH CHAFFIN BARLOW
HAROLD WILFRED BAUGH
JUSTIN LEE BLOOM*
EDWARD ALFRED BOHJANEN
ROBERT JAMES SIDFORD BROWN
FREDERICK BEDELL BURT
BURGESS F. COLLINS*
ARTHUR NELSON COX
DANIEL HAROLD DEUTSCH
WILLIAM ATWOOD DREW
WALTER PASOLD EATHERLY
JAMES CORNELIUS ELMS
SOLOMON FEFERMAN*
RICHARD ALLAN FERRELL*
ROBERT JOE FOSTER
PAUL WILLIAM FULLERTON, JR.
PATRICK NORMAN GLOVER
HOWARD W. GREEN
WILBUR LEE HALL
THOMAS HUMPHRIES
HAMILTON†

ORVAL EUGENE
HAMMERMEISTER
JOHN NATHANIEL HARRIS
JOHN W. HEDENBERG, JR.
ROBERT HENIGSON*
LEONARD FREDERICK
HERZOG, II†
GEORGE STANLEY HOLDITCH†
ALEXANDER FRASER HOLSER
VINCENT RICHARD HONNOLD
WILBUR NELSON JARMIE
ARTHUR LOUIS KOCH
ROBERT SMITH MACMILLAN
HERMAN ALLEN MASON
JOHN MCCARTHY
ALBERT HARRY MCEUEN
DAVID EVERETT METZLER*
EDWARD EUGENE MITCHELL
LOTHROP MITTENTHAL†
STEPHEN CAMBRON MORRISON
WILLIAM LAWRENCE NOON
CARL RAYMOND OBERMAN
ROBERT LEE PEELER, JR.*

ROBERT EDWARD PHILLIPS
JOHN OSCAR RASMUSSEN, JR.*
GEORGE PIERCE RIGSBY*
FRANK CHARLES ROCK, JR.
RICHARD MONROE ROEHM
RONALD BRYAN RUDDICK
ROBERT EMMETT SCOTT
WILLIAM HENRY SHIPPEE
RICHARD ARTHUR SPELLMANN
THOMAS HOWARD STIX*†
ROBERT GREGG STOKELY
ROBERT S. STONE
FERDINAND CHARLES SUHRER
RICHARD B. TALMADGE*
TOM TRACY†
JOSEPH FRANK VALLE-RIESTRA*
SYLVAN DEAN WANLASS
WAYNE BERTRAND WHITE
JOHN WHITTLESEY
DAVID BRICE WILFORD
BYRON LEROY YOUTZ*
LEONARD ZABLOW*
EUGENE BALFOUR ZWICK

BACHELOR OF SCIENCE IN ENGINEERING

RICHARD CLARKE ALEXANDER†
JAMES STEWART ALLEN
ROGER ALAN ANDERSON*
JOHN JOSHUA ATTIAS
YIN-CHING AU
ALAN STEVENSON BAGLEY
ROBERT PAUL BARRACLOUGH
RUPERT MORRIS BAYLEY
JOHN CHRISTIAN BEAR
EARL BEDER
J. MARVIN BLAIR
EMMETT MACDOWELL BOTTS
GEORGE WILLIAM BOUTELLE†
JULIAN SAGE BURROWS, JR.†
STUART MARKLE BUTLER, JR.
WILLIAM JEROME CARROLL
GLENN ALBERT CHAFFEE
GUY ROGER CHAMBERS
ELROY KUI CHON CHINN
WARREN A. CHRISTOPHERSON*
WILLIAM MICHAEL CONNER
PHILIP RUSSELL CONRATH
MITCHELL LAVETTE COTTON

LAWRENCE PHILIP DAHM
ROBERT D. DALTON, JR.
JAMES ROBERT DAVIS
RUSSELL LATHROP DAVIS
WAYNE KENNETH DAVIS
WILLIAM JOSEPH DIXON*
SEBA ELDRIDGE, JR.
FRANK MORTON EMERSON*
ALFRED PAUL FAY
TAYLOR CROSBY FLETCHER
MAX GARBER
ROBERT CHRISTOPHER GASKELL
BRUCE DAVID GAVRIL*
FRED CARL GUNTHER
JAMES ALBERT HARDER*
STANLEY RICHMOND
HARRISON*†
WARREN D. HARRISON
DELBERT ARTHUR HAUSMANN*
KEITH WILBUR HENDERSON
ROBERT JOHN HEPPE*
JAMES E. HOLDITCH
HARVEY KEITH HOLM*
PAUL JOHN HOWARD

HORACE MARTIN HYBERTSEN
BRUCE CHANDLER JONES
ABNER KAPLAN*
SAUL KAPLUN
ROBERT I. KING
PETER C. LAMBERT
PHILIP LAMSON
THOMAS GLENN LANG
CAMERON DOUGLAS
LEAVENWORTH
HOWARD BRADBURY LEWIS, JR.
DONALD MURPHY LILIENTHAL
DONALD E. LOVELACE†
ROBERT CARL LYNN
DOUGLAS JAMES MACLEAN
IRWIN LOUIS MARKOWITZ
WARREN MONROE
MARSHALL, III†
JAMES EUGENE MARTIN
GEORGE ADOLPH MARTINEK
ROGER EDWARD MATZDORFF
RAYMOND ANTHONY
MAURUS, JR.
ROBERT MCCLELLAN

*Graduated with honor in accordance with a vote of the Faculty.

†Awarded the Honor Key by the Associated Students CIT, for participation in student activities.

ROSS MARTIN MEHL
 GLEN HENRY MITCHEL, JR.
 CHARLES COLBURN BILLS
 MOODY, JR.
 BOUDE CLISBY MOORE
 HARRY JAMES MOORE, JR.†
 ALFRED LEVIN MORTIMER
 JOHN KINGSLEY MULLEN
 CHARLES GORDON MURPHY*
 NORMAN ERIC OLSON
 DONALD WALDO OTTO
 PAUL G. PAYNE
 ROBERT MARTIN PEDRAGLIA
 RICHARD CARL PLATZKE*
 HERBERT L. PODELL
 ROBERT WARNER POINDEXTER
 MARSHALL CLARKE POND
 ALLEN THRASHER PUDER
 DAVID EDWARD REESE, JR.

BRUCE BOLTON RENNIE
 JOHN ELLIOTT ROACH, JR.
 HARVEY L. ROBERSON*
 MARTIN SAMUEL ROBINSON*
 GEORGE WINTON ROE, JR.
 EDWARD F. ROSKOWSKI†
 CHANDOS ARTHUR RYPINSKI, JR.
 FRANK F. SCHECK
 HECTOR ANTHONY SCHETNE
 GEORGE ROBARDS SCOTT
 WAYNE E. SEFTON
 WILLIAM SEIDEN†
 JAMES FRANCIS SHIELLS, JR.
 DONALD LOGAN SILLIKER
 WILLIAM EDWARD SMYTH†
 DONALD PARKER SPALDING, JR.
 MIKE EDWARD SPOONER, JR.
 DOUGLAS C. STRAIN
 IRVING IRA SULMEYER

CHARLES SUSSKIND
 JOHN SABIN SWAIN
 KENNETH KAI-NAN TANG
 JAMES RUGGLES THORPE, JR.
 THOMAS VREBALOVICH
 ALFRED EARNEST WATERS
 JOSEPH WOLFF WECHSLER
 ROBERT LEONARD WENICK
 DONALD PAHL WILKINSON*
 JOE KEITH WILLIAMS
 WILLIAM JEFFRIS WILLIAMSON
 ROBERT LEFEVER WINCHESTER*
 FRANK J. WOLF†
 ALBERT KOON-BIU WONG
 WILLIAM LOGAN WOODSON
 BRUCE A. WORCESTER†
 JACOB FRANCIS WOZNIAK, JR.†
 HARVEY WESTON WRIGHT, JR.
 ROBERT ZACHARIAS

*Graduated with honor in accordance with a vote of the Faculty.

†Awarded the Honor Key by the Associated Students CIT, for participation in student activities.

MASTER OF SCIENCE IN SCIENCE

Biology

EMANUEL WINDSOR, B.S., California Institute of Technology, 1938.

Chemistry

- ✓CHARLES IDOL BROWNE, JR., B.A., Drew University, 1941; M.A., University of Texas, 1944.
- ✓GEORGE JOSEPH DOYLE, A.B., San Jose State College, 1940.
- ✓HORST WALTER HOYER, B.S., College of the City of New York, 1942.
- ✓GEORGE LOUIS HUMPHREY, B.A., Marietta College, 1943.
- ✓CARL ROBERT LINDEGREN, A.B., University of California, 1943.
- DALE JOSEPH MEIER, B.S., California Institute of Technology, 1947.
- ✓ROBERT LEROY MILLS, B.S., Washington & Jefferson College, 1943.
- ROLLIE JOHN MYERS, JR., B.S., California Institute of Technology, 1947.
- ✓JAMES EARL WHITNEY, Sc.B., Brown University, 1943.
- ✓ROBERT STANLEY WINNIFORD, B.S., Oregon State College, 1943.

Chemical Engineering

- JOHN S. BILLHEIMER, B.S., California Institute of Technology, 1947.
- ✓JAMES LOGAN BUHLER, B.S., University of California, 1942.
- *GORDON HENRY GOFF, B.S., University of California, 1943.
- BERT HENRY GOLDING, B.S., California Institute of Technology, 1944.
- DONALD IRVING GRANICHER, B.S., California Institute of Technology, 1947.
- ✓JOHN LATIMER MASON, S.B. in Meteorology, University of Chicago, 1944; B.S. in Appl'd Chem.; California Institute of Technology, 1947.
- ✓FREDERICK DENT PARKER, B.S., University of Oklahoma, 1944.
- ✓LEWIS ALVIN ROBINSON, B.S., Lehigh University, 1946.
- ✓DAVID BRITTAIN WILLMER, B.S.E., Princeton University, 1947.

(MASTER OF SCIENCE IN SCIENCE, cont.)

Geological Sciences

- ✓HADDON WILSON AGNEW, B.A., University of British Columbia, 1934.
- ✓MAYETTE ELNER DENSON, JR., B.S., Montana State College, 1941.
- ✓WAKEFIELD DORT, JR., S.B., Harvard University, 1944.
- ✓CHARLES DeVRIES EDWARDS, B.A., Carleton College, 1942.
- ✓ALBERT HENRY HEDDEN, JR., B.A., Williams College, 1946.
- ✓HENRY LINDSAY HEROLD, A.B., University of California, 1945.
- ✓HENRY SELDEN HITCHCOCK, B.A., Pomona College, 1943.
- ✓ROBERT JOHN MACNEILL, B.A., Queens College, 1943.
- ✓HAROLD MORTON MOONEY, S.B., Harvard University, 1943.
- RETURN FRANCIS MOORE, B.S., California Institute of Technology, 1947.
- WAYNE ARTHUR ROBERTS, B.S., California Institute of Technology, 1945.
- EUGENE MERLE SHOEMAKER, B.S., California Institute of Technology, 1947.
- GEORGE G. SHOR, JR., B.S., California Institute of Technology, 1944.
- RAYMOND JAMES SMITH, B.S., California Institute of Technology, 1945.

Meteorology

- ✓HAROLD OSCAR BERGMAN, Capt., U.S.A.F., B.S., University of Colorado, 1938.
- ✓JAMES ARTHUR BUNCE, Capt., U.S.A.F., B.S., Georgia Teachers College, 1942.
- ✓HENRY ROY CHOPE, JR., B.E.E., Ohio State University, March, 1948.
- ✓ALBERT RAYMOND CLARK, Lt., U.S.A.F., B.S., Western Michigan College of Education, 1942.
- ✓WILLIAM DONHAM CRAWFORD, B.S., United States Naval Academy, 1947.
- ✓EDWIN BASCOM DICKSON, Lt., U.S.A.F., B.S. in E.E., Georgia School of Technology, 1942;
B.S. in Math., University of Tampa, 1943.
- ✓LUTHER FITZGERALD FISHER, B.A., Southern Methodist University, 1947.
- ✓LEWIS OCTAVE GRANT, B.S., University of Tulsa, 1947.
- ✓CARL ROBERT HAMILTON, Major, U.S.A.F., B.S., Colorado State College, 1934.
- ✓GEORGE JAMES HEBEL, B.S., University of Illinois, 1940.
- ✓LYNN THORNTON IRISH, Major, U.S.A.F., B.S., Iowa State College, 1938.
- ✓CHARLES OTTO JENISTA, JR., B.S., Ohio State College, March, 1948.
- ✓GEORGE ARTHUR JENSEN, B.A., College of the Pacific, 1947.
- ✓GEORGE JOSEPH NEWGARDEN, III, Capt., U.S.A.F., B.S., University of Maryland, 1943.
- ✓EDWARD DIONYSIUS OLIVER, JR., B.S., Sulross University, 1947.
- ✓RALPH MCGEE ROTT, B.S., State University of Iowa, 1947.
- ✓WILLIAM HAROLD SHIVAR, Lt., U.S.A.F., B.S., Presbyterian College, 1947.
- ✓JOHN THOMAS SLUSHER, B.A., Austin College.
- ✓DAVID S. STOLLER, A.B., University of California at Los Angeles, 1947.
- ✓MILTON ARTHUR STRAUSS, B.S., California Institute of Technology, 1946.
- ✓EDWARD ALEXANDER TAYLOR, B.S., University of Nebraska.
- ✓RAYMOND NICHOLAS TOMLIN, B.S., University of Colorado, 1947.
- CHAROEN VADHANAPANICH, B.S., California Institute of Technology, 1947.
- JOE KEITH WILLIAMS, California Institute of Technology.
- ✓MARION C. WOODS, B.S., Colorado State College, 1947.

Physics

- ✓WILLIAM ALFRED BARKER, II, B.A., Yale University, 1941.
- ✓JULIUS SAMUEL BENDAT, A.B., University of California, 1944.

- ✓ JAMES ROY BROWN, B.S., Allegheny College, 1944.
- ✓ WILLIAM WALTON CARTER, B.S., Carnegie Institute of Technology, 1943.
- ✓ ARNOLD FELDMAN, B.S., Pennsylvania State College, 1944.
- ✓ HARVEY JUNIOR FLETCHER, B.S., Massachusetts Institute of Technology, 1944.
- ✓ DONALD THEODORE GREENWOOD, B.S., California Institute of Technology, 1944.
- ✓ CHIEN HSIAO, B.S., National Southwest Associated University, Peiping, China, 1944.
- ✓ CHIA LIN HSIEH, B.S., Yenching University, Chengtu, China, 1943.
- ✓ ERDAL INONU, University of Ankara, Turkey, 1947.
- ✓ PAUL BEATTIE MACCREADY, JR., B.S., Yale University, 1947.
- ✓ RICHARD IRVING MADDOX, B.S., United States Naval Academy, 1941.
- ✓ GEORGE MICHAEL SAFONOV, B.S., California Institute of Technology, 1943.
- ✓ JOHN DORRINGTON SEAGRAVE, B.S., California Institute of Technology, 1946.
- ✓ LEON SHENFIL, B.S., California Institute of Technology, 1947.
- ✓ GEORGE FOSTER SMITH, B.S., California Institute of Technology, 1944.
- ✓ GEORGE POWELL STECK, A.B., University of California, 1945.
- ✓ ROBERT KESSLER SWANK, B.A., Miami University, 1943.
- ✓ ROLAND WALTER URE, JR., B.S.E., University of Michigan, 1947.
- ✓ WILLIAM ALFRED WENZEL, B.A., Williams College, 1944.

MASTER OF SCIENCE IN ENGINEERING

Aeronautics

- ✓ CLIFTON LEON ADCOCK, B.S., Agricultural and Mechanical College of Texas, 1946.
- ✓ JOHN WILLIAM BACON, JR., B.S., California Institute of Technology, 1943.
- ✓ WILLIAM CYRUS BARKER, B.S., University of California, 1942.
- ✓ ROBERT ERNEST BENEFIEL, Capt., U.S.A.F., B. Aero. E., Rensselaer Polytechnic Institute, 1942.
- ✓ JOSEPH NISSIM BENEZRA, B.S., University of Washington, 1944.
- ✓ PHILIP G. BLENKUSH, B. Aero. E., University of Detroit, 1941.
- ✓ JAMES DONAHUE BURKE, B.S., California Institute of Technology, 1945.
- ✓ FENG-KAN CHUANG, B.S., Chiao Tung University, Shanghai, 1946.
- ✓ DONALD COLES, B.S., University of Minnesota, 1947.
- ✓ CARL BRITTON COX, A.B., University of California at Los Angeles, 1936; M.A., University of California at Los Angeles, 1939.
- ✓ JAMES ROY DALE, JR., Major, U.S.A.F., B.S., Virginia Military Institute, 1941.
- ✓ ORIN JACK DEMUTH, B.S., California Institute of Technology, 1947.
- ✓ JAMES EDWARD DENSMORE, B.S., California Institute of Technology, 1946.
- ✓ JAMES FREDERICK DRAKE, B.S., California Institute of Technology, 1946.
- ✓ LORNE CAMPBELL DUNSWORTH, B.Eng., McGill University, 1944.
- ✓ MANFRED EIMER, B.S., California Institute of Technology, 1947.
- ✓ HAMED KAMAL ELGIN, B.Eng., Fouad I University, Cairo, Egypt, 1945.
- ✓ HOWARD LEONARD ENGEL, B.S., Carnegie Institute of Technology, 1944.
- ✓ PERRY HUSTON EUBANK, Lt. Col., A.G.F., B.S., United States Military Academy, 1937.
- ✓ DONALD LOWELL FRANCIS, B.S., California Institute of Technology, 1945.
- ✓ JACK EDWARD FROELICH, B.S., California Institute of Technology, 1947.
- ✓ EDGAR WILLIS GREGORY, II, Capt., U.S.A.F., B.S., United States Military Academy, 1944.
- ✓ EDWARD NATHANIEL HALL, Major, U.S.A.F., B.S. in Eng., College of the City of New York, 1935; B.S. in Chem. Eng., College of the City of New York, 1936.
- ✓ JAMES NEWTON HALL, Major, U.S.A.F., B.S., Purdue University, 1940.
- ✓ MALCOLM STUART HARNED, B.S., University of Kansas, 1943.
- ✓ THOMAS P. HIGGINS, JR., B.S., University of Oklahoma, 1943.
- ✓ HAROLD M. HIPSH, B.S., California Institute of Technology, 1947.

(MASTER OF SCIENCE IN ENGINEERING—*Aeronautics*, cont.)

- ✓ WILLIAM SUMPTER JOHNSON, JR., B. Aero. E., North Carolina State College of Agriculture and Engineering, 1942.
- FRANKLIN H. KNEMEYER, B.S., California Institute of Technology, 1944.
- ✓ HARVEY H. LATSON, JR., Major, U.S.A.F., B.S., United States Military Academy, 1943.
- ✓ BENOIT B. MANDELBROT, B.S., Université de Clermont-Ferrand, 1942; Ingenieur de L'Ecole Polytechnique, 1947; Licencié ès Sciences Mathématiques et Physiques, Université de Paris, 1947.
- ✓ ROBERT WAYNE MCJONES, B.S., University of Kansas, 1947.
- JOHN DILL MCKENNEY, B.S., California Institute of Technology, 1945.
- ✓ GILBERT GUNTER MOREHOUSE, Capt., U.S.A.F., B.S., University of Nevada, 1942.
- ✓ HARVEY ORIN NAY, B.S., University of Colorado, 1947.
- ✓ DOUGLAS CLARK OGILVIE, B.S., University of California, 1947.
- BLAINE R. PARKIN, B.S., California Institute of Technology, 1947.
- ✓ GEOFFREY VERNON PARKINSON, B.A.Sc., University of British Columbia, 1946.
- EDWIN POUNDER, B.S., California Institute of Technology, 1946.
- ✓ ARTHUR WAYNE REED, Major, A.G.F., B.S., United States Military Academy, 1939.
- ✓ WAYNE E. RHYNARD, Lt. Col., U.S.A.F., B.S., United States Military Academy, 1941.
- EUGENE S. ROSE, JR., Lt., U.S.A.F., B.S., California Institute of Technology, 1947.
- ✓ GERALD DOWD RYAN, B.S., Worcester Polytechnic Institute, 1947.
- LOUIS VINCENT SCHMIDT, B.S., California Institute of Technology, 1946.
- HARRIS MCINTOSH SCHURMEIER, B.S., California Institute of Technology, 1945.
- DAVID EDWIN SHONERD, B.S., California Institute of Technology, 1943.
- ✓ ROBERT RICHARD SOLVERSON, S.B., Harvard University, 1944.
- ✓ BASIL STAROS, B.S., Massachusetts Institute of Technology, 1941.
- ✓ ROBERT STANLEY STEWART, B. Aero. E., University of Minnesota, 1943.
- ✓ TORSTEIN STRAND, B.S., Massachusetts Institute of Technology, 1947.
- JAY WILLIAM STUART, JR., B.S., California Institute of Technology, 1946.
- ✓ CONSTANTINE SVMONOFF, Lt., U.S.A.F., AAF Institute, Tech. Wright Field, 1947.
- ✓ JAMES KIRKBRIDE TAYLOR, Major, A.G.F., B.S., United States Military Academy, 1940.
- ✓ JOHN WILLIAM THOMAS, B.S., United States Naval Academy, 1935.
- ✓ FRANK WESLEY VONTUNGELN, B.S., Oklahoma A. and M. College, 1942.
- ✓ JAMES WILLARD WALTERS, JR., Major, A.G.F., B.S., United States Military Academy, 1940.
- ✓ THORNTON ARNOLD WILSON, B.S., Iowa State College, 1943.
- ✓ JOHN KENNETH WIMPRESS, B.S., Georgia School of Technology, 1946.
- ✓ ROBERT M. WRAY, Lt. Col., U.S.A.F., B.S., United States Military Academy, 1939.

Civil Engineering

- ✓ MIHRAN S. AGHABIAN, B.A. in Physics, American University of Beirut, Lebanon, 1944; B.S. in C.E., American University of Beirut, 1947.
- ✓ MATTHEW JOHN ALTENHOFEN, Lt. Col., U.S.A., B.S., United States Military Academy, 1938.
- ✓ ADAM JACK BEINSCHROTH, B.C.E., Rensselaer Polytechnic Institute, 1947.
- ✓ ANDREW THOMSON BINGHAM, B.C.E., University of Saskatchewan, 1947.
- ✓ DOUGLAS KING BLUE, Major, U.S.A., B.S., Union College, 1939; B.S., United States Military Academy, 1943.
- FRANCIS ROBERT BOWERMAN, B.S., California Institute of Technology, 1947.
- ROBERT KING BREECE, B.S., California Institute of Technology, 1947.
- ✓ CURTIS WHEATON CHAPMAN, JR., Lt. Col., U.S.A., B.S., United States Military Academy, 1941.
- ✓ ROBERT LEWIS COLLINS, B.S., University of Texas, 1947.
- ✓ EDWARD GAYLORD COOK, Lt. Col., U.S.A., B.S., United States Military Academy, 1940.
- ✓ HARVEY REED FRASER, Lt. Col., U.S.A., B.S., United States Military Academy, 1939.

- ✓ FRANK AUSTIN GERIG, JR., Major, U.S.A., B.S., United States Military Academy, 1941.
- ✓ JOHN DEAN HOLM, Lt. Col., U.S.A., B.S., University of Minnesota, 1937.
- ✓ ROY SKILES KELLEY, Lt. Col., U.S.A., B.S., Western Kentucky State Teachers College, 1939; B.S., United States Military Academy, 1941.
- ✓ ELMORE GRENVILLE LAWTON, Lt. Col., U.S.A., B.S., Clemson Agricultural College, 1933.
- ✓ NEVILLE STUART LONG, B.S., California Institute of Technology, 1944.
- ✓ WILLIAM PEARSON LUNDY, B.S., California Institute of Technology, 1947.
- ✓ ALBERT EDGAR MCCOLLAM, Lt. Col., U.S.A., B.S., United States Military Academy, 1939.
- ✓ EUGENE PORTER RICHEY, B.S., University of Alaska, 1941.
- ✓ ANDREW P. ROLLINS, JR., Lt. Col., U.S.A., B.S., Agricultural & Mechanical College of Texas, 1939.
- ✓ JAMES THOMAS ROSTRON, B.S., University of California, 1941.
- ✓ LEIF SKOGSTAD, B.S., University of Wisconsin, 1947.
- ✓ JULIAN VINCENT SOLLOHUB, Lt. Col., U.S.A., B.S., United States Military Academy, 1937.
- ✓ ROBERT MARSHALL WHITENTON, Major, U.S.A., B.S., Oklahoma A. & M. College, 1942.
- ✓ DONALD BURNS WILLIAMS, Major, U.S.A., C.E., Cornell University, 1934.

Electrical Engineering

- ✓ FRED PETER ADLER, B.S., University of California, 1945.
- ✓ JACK STEELE ANDERSON, B.S., University of Texas, 1946.
- ✓ HERBERT KURT BARNETT, B.E.E., McGill University, 1946.
- ✓ CARL WILLIAM BERGMAN, JR., B.S., Worcester Polytechnic Institute, 1945.
- ✓ JOHN MASON BUCHANAN, B.E.E., University of Virginia, 1944.
- ✓ CHARLES EDWARD BURDG, B.S., California Institute of Technology, 1946.
- ✓ JOHN JUNIOR BURKE, B.S., California Institute of Technology, 1946.
- ✓ JOHN PAUL DAVIS, B.S., University of Colorado, 1946.
- ✓ DOUGLAS GEORGE DETHLEFSEN, B.S., California Institute of Technology, 1945.
- ✓ HARRY MCPHEE ELLIS, B.Ap.Sc., University of British Columbia, 1945.
- ✓ GEORGE WALTER EPPRECHT, Diplom, Electro-Ingenieur, Swiss Federal Institute of Technology, 1946.
- ✓ FRANCIS EVARTS FAIRMAN, III, B.S., Haverford College, 1945.
- ✓ RAYMOND WILLIAM FERGUSON, B.S., Agricultural & Mechanical College of Texas, 1947.
- ✓ GEORGE JAY GLEGHORN, JR., B.S., University of Colorado, 1947.
- ✓ JAMES WARD HAGER, B.S., University of Wisconsin, 1946.
- ✓ DONALD JAMES HASS, B.S., California Institute of Technology, 1946.
- ✓ JAMES WARREN HILL, B.S., California Institute of Technology, 1933.
- ✓ ROBERT CLARKE HOPKINS, A.B., College of Emporia, 1935.
- ✓ WILLIAM FRANKLIN HORTON, B.S., California Institute of Technology, 1946.
- ✓ SOL MATT, B.S., Ohio University, 1944.
- ✓ WILLIAM CARL McDONELL, B.S., California Institute of Technology, 1945.
- ✓ DUANE TORRANCE MC RUER, B.S., California Institute of Technology, 1945.
- ✓ EDWARD VAUGHAN PHILLIPS, B.S., University of Illinois, 1945.
- ✓ JOHN CUMMING RIEDEL, B.S., California Institute of Technology, 1947.
- ✓ KENNETH WALTER ROBINSON, B.S., California Institute of Technology, 1946.
- ✓ PAUL SANFORD ROGELL, B.S., Iowa State College, 1944.
- ✓ HAROLD ALVIN ROSEN, B.E., Tulane University, 1947.
- ✓ GEORGE ROBERT SCHULL, B.S., Rose Polytechnic Institute, 1941.
- ✓ HUGO DAVID SCHWARTZ, Escuela de Artes y Oficios.
- ✓ BERNARD OWEN STEENSON, B.S., Illinois Institute of Technology, 1944.
- ✓ MALCOLM HARWOOD STEWARD, A.B., University of California at Los Angeles, 1942.
- ✓ DARIUS ERUCH SUKHIA, B.S., Bombay University, 1940.

(MASTER OF SCIENCE IN ENGINEERING—*Electrical Engineering*, cont.)

- RAYMOND BERNARD TASKER, B.S., California Institute of Technology, 1947.
✓ VINCENT ALMON VIS, B.S.E. (Chem. Eng.), University of Michigan, 1941; B.S.E. (Math.), University of Michigan, 1941.
CLARENCE LEON WELLIVER, B.S., California Institute of Technology, 1945.
✓ EDWARD YORK, JR., A.B., University of California at Los Angeles, 1941.

Mechanical Engineering

- ✓ JAMES EDWARD ASH, B.S.M.E., Illinois Institute of Technology, 1947.
✓ NIELS JOHANNES BECK, B.S., University of Colorado, 1947.
✓ JOHN ALBERT BURTON, B.A.Sc. (M.E.), University of British Columbia, 1944; B.A. (Math.), 1947.
✓ TAO HUNG CHU, Diploma in M.E., Henry Lester Institute of Technical Education, Shanghai, 1943.
DONALD GUY FURST, B.S., California Institute of Technology, 1946.
JOHN HENRY GERPHEIDE, B.S., California Institute of Technology, 1945.
✓ GEORGE ELMER HLAVKA, B.S., University of Wisconsin, 1946.
✓ RICHARD FREDERICK JOHNSON, B.S., Agricultural & Mechanical College of Texas, 1947.
JOHN KAYE, B.S., California Institute of Technology, 1939.
✓ LEROY COSBY LAND, B.S., Utah State Agricultural College, 1940.
✓ RICHARD FRANK LEMON, B.S., University of Oklahoma, 1945.
✓ LLOYD GERALD, B.M.E., Ohio State University, 1943.
✓ RICHARD LEE ROBINSON, S.B., Massachusetts Institute of Technology, 1947.
LYLE DEAN SIX, B.S., California Institute of Technology, 1947.
RICHARD JOSEPH SOIKE, B.S., California Institute of Technology, 1944.
✓ PAUL GUSTAV STEIN, B.S.M.E., University of Rochester, 1947.
WILBUR MILTON SWANSON, B.S., California Institute of Technology, 1944.
✓ FRED MILTON WELLS, B.S., University of Kentucky, 1947.

ENGINEER'S DEGREES

Aeronautical Engineer

- ✓ JOHN H. ALTSEIMER, B.S. (M.E.), University of Wisconsin, 1941; M.S., California Institute of Technology, 1946.
WARREN AMSTER, B.S., California Institute of Technology, 1944; M.S., 1947.
✓ ROLF DIETRICH BUHLER, B.A.E., University of Minnesota, 1943; M.S., California Institute of Technology, 1944.
✓ RAYMOND LU-PO CHUAN, B.A., Pomona College, 1944; M.S., California Institute of Technology, 1945.
THOMAS V DAVIS, B.S., California Institute of Technology, 1938; M.S., 1947.
✓ HAROLD M. DEGROFF, JR., B. Aero. E., Rensselaer Polytechnic Institute, 1946; M.S., California Institute of Technology, 1947.
✓ WELKO ELTON GASICH, A.B., Stanford University, 1943.
✓ HARRY FREDERICK IMSTER, B.S.E., University of Michigan, 1946; M.S., California Institute of Technology, 1947.
✓ ARNOLD AXTELL JENSEN, B. Phys., University of Minnesota, 1939; M.S., California Institute of Technology, 1947.
✓ CHINTAKINDI VENKATA JOGARAO, B.S., Benares Hindu University, India, 1944; M.S., Stanford University, 1947.
✓ WARREN GOTTLIEB KOERNER, B.S., Purdue University, 1942; M.S., California Institute of Technology, 1947.
✓ SEYMOUR LAMPERT, B.S. in A.E., Georgia School of Technology, 1943; M.S., California Institute of Technology, 1947.

- ✓ JAMES STEVEN LESKO, B. Aero. E., Rensselaer Polytechnic Institute, 1943; M.S., California Institute of Technology, 1947.
- ✓ RICHARD JEFFREY MAGNUS, B. Aero. E., University of Minnesota, 1944; M.S., University of Minnesota, 1947.
- ✓ BERNARD WALTER MARSCHNER, B. Aero. E., University of Minnesota, 1942; M.S., California Institute of Technology, 1947.
- ✓ HERMAN MILLER, B.S., California Institute of Technology, 1943; M.S., 1945.
- ✓ WALTER PATRICK MURPHY, JR., Lt. Comdr., U.S.N., B.S., United States Naval Academy, 1941.
- ✓ CONRAD NATHANIEL NELSON, Capt., U.S.A.F., S.B., Massachusetts Institute of Technology, 1941; M.S., California Institute of Technology, 1947.
- ✓ ERNEST I. PRITCHARD, B.S., Antioch College, 1943; M.S., California Institute of Technology, 1947.
- ✓ DONALD BARSTOW SEAGER, B.S., University of California, 1942; M.S., California Institute of Technology, 1947.
- ✓ WILLIAM EDWARD SIMS, Lt. Comdr., U.S.N., B.S., United States Naval Academy, 1941.
- ✓ MERVIN OTIS SLATER, Lt. Comdr., U.S.N., B.S., United States Naval Academy, 1941.
- ✓ JOSIAH E. SMITH, B.S., California Institute of Technology, 1939; M.S., 1940.
- ✓ NATESAN SRINIVASAN, B.S., Madras University, India, 1938; M.S., California Institute of Technology, 1946.
- ✓ WILBERT GAYTON WHELDON, B.S., United States Naval Academy, 1941; M.S., California Institute of Technology, 1947.
- ✓ RICHARD STREET WHITE, III, Lieut., U.S.N., B.S., United States Naval Academy, 1942.
- ✓ MAX L. WILLIAMS, JR., B.S., Carnegie Institute of Technology, 1942; M.S., California Institute of Technology, 1947.
- ✓ WILLIAM STUART WUNCH, B.S. (A.E.), University of Michigan, 1945; B.S. (Ma.), 1945.

Chemical Engineer

- ✓ CHARLES EDWARD AUERBACH, B.S., University of California, 1942; M.S., California Institute of Technology, 1947.
- ✓ PAUL STEPHEN FARRINGTON, B.S., California Institute of Technology, 1941; M.S., 1947.
- ✓ JAMES WILLIAM GLANVILLE, B.S., Rice Institute, 1944; M.S., California Institute of Technology, 1946.
- ✓ JOSEPH DENNIS YANAK, B.S., Lafayette College, 1939; M. Ch. E., Polytechnic Institute of Brooklyn, 1942.

Civil Engineer

- ✓ PHILLIP EISENBERG, B.S., Wayne University, 1941.
- ✓ GURUVAYUR SUBRAMANYAM RAMASWAMY, B.S., Madras University, India, 1944; M.S., California Institute of Technology, 1947.

Electrical Engineer

- ✓ PAUL SANFORD ROGELL, B.S., Iowa State College, 1944.

Industrial Designer

- ✓ ROBERT ELSTON BOND, B.A., Yale University, 1940.
- ✓ ROBERT PHILIP BRINKMAN, B.S., Iowa State College, 1943.
- ✓ HAROLD HARRISON FORD, B.S., California Institute of Technology, 1945.
- ✓ ROBERT FRANCIS MCLEAN, B.S., California Institute of Technology, 1943.
- ✓ RAYMOND JEFFERSON PALMER, B.S., California Institute of Technology, 1944.

(ENGINEER'S DEGREES—*Industrial Designer*, cont.)

- JEROME WESLEY PARKS, B.S., California Institute of Technology, 1945.
✓ CHARLES CRAIG PAUL, B.S., Northeastern University, 1941.
✓ SIDNEY R. SHANNON, JR., B.S., North Dakota Agricultural College, 1936.
✓ HARVEY JOHN WHITE, B.E., University of Southern California, 1944.
✓ CURTIS CRUVER WHITTLESEY, B.E., University of Southern California, 1944.

Mechanical Engineer

- ✓ OLIVER A. BAER, A.B., Stanford University, 1943; M.S., California Institute of Technology, 1947.
✓ DAVID ARTHUR ELMER, B.S., California Institute of Technology, 1943; M.S., 1947.
✓ CHI-NAN HSU, B.S., Chiao-Tung University, Chungking, China, 1941.
✓ OMER ISMET INONU, Istanbul Technical University, Turkey.
✓ LEROY COSBY LAND, Major, U.S.A., B.S., Utah State Agricultural College, 1940.
✓ WALTER CHARLES SWAN, B.M.E., Rensselaer Polytechnic Institute, 1942; M.S., Northwestern University, 1947.

Meteorologist

- ROBERT FRANKLIN STRICKLER, B.S., California Institute of Technology, 1941; M.S., 1942.

DOCTOR OF PHILOSOPHY

- RAYMOND VOILES ADAMS, JR. (Physics and Mathematics), B.S., Kansas State College of Agriculture and Applied Science, 1941. Thesis: Cloud Chamber Studies in Cosmic Rays at an Altitude of 30,000 Feet.
NICHOLAS ANTHONY BEGOVICH (Electrical Engineering and Physics), B.S., California Institute of Technology, 1943; M.S., 1944. Thesis: A Contribution to the Theory of Thermionic Vacuum Tubes.
GLENN WAGNER BILLMAN (Chemical Engineering and Mechanical Engineering), B.S., California Institute of Technology, 1941; M.S., 1942. Thesis: I. The Transfer of Energy From a Heated Cylinder to a Turbulently Flowing Air Stream; II. The Diffusion of Energy in the Wake of a Heated Cylinder Exposed to a Turbulently Flowing Air Stream.
JOHN A. BROCKMAN, JR. (Chemistry and Animal Physiology), B.S., California Institute of Technology, 1942. Thesis: Studies on *Dicroa Febrifuga*; A Method for Estimating Chloride; Studies on *Cambarus Clarkii*.
DAVID HENRY BROWN (Chemistry and Plant Physiology), B.S., California Institute of Technology, 1942. Thesis: I. Studies on Blood Group A Specific Substance; II. The Synthesis of Three Acylated Dipeptide Esters; III. Ionization Constants of Several Substituted Phenylarsonic Acids.
DEAN RODEN CHAPMAN (Aeronautics and Mathematics), B.S., California Institute of Technology, 1944; M.S., 1944. Thesis: Theory of Base Pressure for Supersonic Speeds.
WILLIAM HARRISON CORCORAN (Chemical Engineering and Mechanical Engineering), B.S., California Institute of Technology, 1941; M.S., 1942. Thesis: I. Temperature Gradients in Turbulent Gas Streams; II. Thermodynamic Properties of Methane at Low Temperature.
EUGENE WOODVILLE COWAN, JR. (Physics and Electrical Engineering), B.S., University of Missouri, 1941; M.S., Massachusetts Institute of Technology, 1943. Thesis: Cloud Chamber Observations of Cosmic Rays at High Altitude.
GEORGE ALEXANDER FEIGEN (Immunology and Animal Physiology), A.B., University of California, 1938. Thesis: I. Physiological Behavior of Oxypolygelatin; II. Relative Sensitivity of Mucosal and Peritoneal Surfaces of Guinea Pig Ilium to Stimulants.
JAMES CHIPMAN FLETCHER (Physics and Mathematics), A.B., Columbia University, 1940. Thesis: Cloud Chamber Studies of Cosmic Rays.
YUAN-CHENG FUNG (Aeronautics and Mathematics), B.S., National Central University, China, 1941; M.S., 1943. Thesis: Elastostatic and Aeroelastic Problems Relating to Thin Wings of High Speed Airplanes.

- WALTER WILLIAM GARVIN (Physics and Mathematics), B.S., Massachusetts Institute of Technology, 1944; M.S., California Institute of Technology, 1945. Thesis: Absorption of Sound by Small, Spherical Obstacles.
- REED ALDEN GRAY (Biochemistry and Plant Physiology), B.S., University of Utah, 1943; M.S., 1944. Thesis: Inhibitors of Plant Growth From the Leaves of *Encelia farinosa*.
- ROBERT NOEL HALL (Physics and Mathematics), B.S., California Institute of Technology, 1942. Thesis: The Production of High Intensity Proton Beams.
- KENNETH WAYNE HEBBERG (Chemistry and Physics), B.S., Oregon State College, 1943. Thesis: Determination of Some Molecular Structures by the Methods of Electron and X-Ray Diffraction.
- CHUNG-PEN HO (Meteorology and Physics), B.S., National Tsing-Hua University, China, 1932; M.S., California Institute of Technology, 1945; Meteorologist, 1946; Thesis: Forecasting Mean Weekly Temperature by Statistical-Synoptic Considerations.
- GEORGE HOLZMAN (Chemistry and Plant Physiology), B.S., California Institute of Technology, 1942. Thesis: Studies on Blood Group A Substance.
- HAROLD SLEDGE JOHNSTON (Chemistry and Physics), A.B., Emory University, 1941. Thesis: I. The Kinetics of the Fast Reaction Between Ozone and Nitrogen Dioxide; II. A Mechanism for the Formation of Red Phosphorus From White Phosphorus in Solution.
- JACK WARREN KEUFFEL (Physics and Mathematics), A.B., Princeton University, 1941. Thesis: Parallel-plate Counters and the Measurement of Very Short Time Intervals.
- PETER RUDOLF KYROPOULOS (Mechanical Engineering and Civil Engineering), University of Göttingen, 1937; M.S., California Institute of Technology, 1938. Thesis: Dynamic Effects on the Gas Exchange Process in Two Stroke Cycle Engines.
- HARRY LASS (Mathematics and Physics), A.B., University of California at Los Angeles, 1938; M.A., 1940. Thesis: The Differential Geometry of a Space With a Two-point Differential Metric.
- JOHN LAUFER (Aeronautics and Physics), B.S., Louisiana State University, 1942; M.S., California Institute of Technology, 1943; Ae.E., 1944. Thesis: Investigation of Turbulent Flow in a Two-dimensional Channel.
- DAVID ARTHUR LIND (Physics and Mathematics), B.S., University of Washington, 1940; M.S., California Institute of Technology, 1943. Thesis: Precision Spectroscopy of X and Gamma Radiation Using the Focusing Crystal Principle. A Determination of the Luminosity in the Wavelength Range 10 to 500 X.U. and a Preliminary Measurement of Gamma Radiation From Gold Au¹⁹⁸.
- FRANK EARL MARBLE (Aeronautics and Mathematics), B.S., Case School of Applied Science, 1940; M.S., 1942; Ae.E., California Institute of Technology, 1947. Thesis: Rotational Motion of an Ideal Fluid.
- MARK MUIR MILLS (Physics and Mathematics), B.S., California Institute of Technology, 1940. Thesis: A Study of the Altitude Dependence of the Large Cosmic-Ray Showers.
- FERN WOOD MITCHELL, JR. (Chemistry and Plant Physiology), A.B., University of Alabama, 1938; M.S., California Institute of Technology, 1946. Thesis: The Cyclic Phosphites of Propylene Glycol.
- RICHARD ALAN MONTGOMERY (Electrical Engineering and Physics), B.A., University of British Columbia, 1940; M.S., California Institute of Technology, 1946. Thesis: Geiger Counter Investigations of Cosmic Rays.
- THOMAS EDMOND OBERBECK (Mathematics and Physics), B.A., Washington University, 1938; A.M., University of Nebraska, 1940. Thesis: Trigonometric Expansions of Doubly Periodic Functions of the Second Kind in Any Number of Variables.
- MAX LUDWIG PANZER (Biochemistry and Plant Physiology), B.S., California Institute of Technology, 1944; M.S., 1945. Thesis: Studies on the Kidney Transamidinase System.
- RALPH RONALD RAU (Physics and Mathematics), B.S., College of Puget Sound, 1941; M.S., California Institute of Technology, 1943. Thesis: Cloud Chamber Observations of Cosmic Rays at 30,000 Feet Elevation.
- FREDERICK CROUCH ROOP (Meteorology and Applied Mechanics), A.B., Princeton University, 1935; M.S., Harvard University, 1936. Thesis: Rainfall Time-Patterns in Relation to Streamflow Yield for a Typical San Gabriel Mountain Watershed.
- VICTOR SCHOCKEN (Plant Physiology and Immunochemistry), B.A., New York University, 1942; M.S., Oregon State College, 1944. Thesis: The Genesis of Indole-Acetic Acid During the Decomposition of Proteins.

(DOCTOR OF PHILOSOPHY, cont.)

- JESSE ROBERTSON SINGLETON (Genetics and Embryology), A.B. & B.S., North West Missouri State Teachers College, 1938; A.M., University of Missouri, 1941. Thesis: Cytogenetic Studies on *Neurospora crassa*.
- CONWAY WILSON SNYDER (Physics and Mathematics), A.B., University of Redlands, 1939; M.S., State University of Iowa, 1941. Thesis: Investigations of Proton-scattering from Lithium with a Magnetic Spectrograph.
- JOHN DANIEL SPIKES (Embryology and Plant Physiology), B.S., California Institute of Technology, 1941; M.S., 1946. Thesis: Experiments on Fertilization and Cleavage.
- YU-WEI TANG (Plant Physiology and Biochemistry), B.S., National Central University, China, 1940. Thesis: The Enzymatic Inactivation of Indole-Acetic Acid.
- LUIS HERNAN TEJADA-FLORES (Electrical Engineering and Mathematics), B.S., California Institute of Technology, 1938; M.S., 1943. Thesis: The Influence of Open Flame Temperature on the Breakdown Potential of Air at Atmospheric Pressures.
- JOHN FRANK THURLOW (Biochemistry, Bio-organic Chemistry and Plant Physiology), B.S., Bates College, 1943. Thesis: Certain Aspects of Photoperiodism.
- LEON TRILLING (Aeronautics and Physics), B.S., California Institute of Technology, 1944; M.S., 1946; Ae.E., 1947. Thesis: Investigation Into the Flow of a Viscous Heat-conducting Compressible Fluid.
- JAMES GUTWILLIG WENDEL (Mathematics and Physics), B.A., Reed College, 1943. Thesis: A Degenerate Van der Pol Equation.
- ARTHUR GREENVILLE WHITTAKER (Chemistry and Physics), B.S., Washington University, 1940. Thesis: I. An Electron Diffraction Investigation of Vanadium Tetrachloride; II. Magnetic Susceptibility, Freezing Point Diagram, Density, and Spectral Absorption of the System Vanadium Tetrachloride-Carbon Tetrachloride; III. Vanadium Nitrosyl Chlorides.
- CHARLES HAROLD WILTS (Electrical Engineering, Physics and Mathematics), B.S., California Institute of Technology, 1940; M.S., 1941. Thesis: A Measurement of the Ratio of Charge to Mass of Free Electrons Using a Resonant Cavity.
- FREDERICK HAMILTON WRIGHT (Physics and Mathematics), A.B., Haverford College, 1934. Thesis: A Method of Measuring the Rate of Ion Diffusion in a Turbulent Air Stream.

UNDERGRADUATE PRIZE AWARDS

CONGER PEACE PRIZE ORATION

(Established in 1912 by the late Everett D. Conger, D.D.)

First Prize: ROBERT J. HEPPE

Second Prize: JOHN HEATH, JR.

MARY A. EARL McKINNEY PRIZE IN ENGLISH

(Established in 1946 by Samuel P. McKinney, M.D., of Los Angeles, as a memorial to his mother)

First Prize: JAMES D. YOUNG

Second Prize: CARL A. PRICE

FREDERIC W. HINRICHS, JR., MEMORIAL AWARD

(Established in 1948 by the Trustees of the Institute in memory of Frederic W. Hinrichs, Jr., member of the Institute Faculty and Dean, 1921-1944. The award is made annually at Commencement to "the senior who, in the opinion of the undergraduate Deans, has throughout his years at the Institute made the greatest contribution to the welfare of the student body and whose qualities of leadership, character and responsibility have been outstanding.")